# Tourists' Accessibility Mobile Assistive System (TAMAS): in Facilitating Visitor's Interaction with Zambia's Tourism Industry

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*Abstract*— **The Tourists Accessibility Mobile Assistive System (TAMAS) was envisaged as one stop shop tool that provide visitors world-wide with guided information on Zambia's tourism attraction, and also on hotel, transport, and tour guide accessibility. The system was built on an Android phone called Samsung Galaxy J5 (2016), where Android Studio version 2.1.2 was used to develop the code that was written in JAVA. The TAMAS is a user friendly mobile automated system which tourists navigate to see all Zambia's national parks and kinds of animals inhabit in those areas. The system is assistive in online booking of transport, hotels, and tour guides. In that way the TAMAS, gives the visitors an insight motivational drive to choose Zambia to travel and visit such tourism attractions as marketed on the system. The system gives visitors advance information that allows them to plan their travel ahead before they leave their respective countries. The convenience of using the TAMAS and its capability to market the Zambia's tourism attraction would definitely attract more tourists, and this would also raise the GDP of the country.**

*Keywords- Android; animals; mobile phone; national parks, Samsung Galaxy J5 (2016), TAMAS, tourist, tourism attraction*

## I. INTRODUCTION

This The Tourists Accessibility Mobile Assistive System in this work abbreviated as TAMAS was envisaged as a one-stop-shop for provision of tourism information to the tourists from all parts of the world. The TAMAS was designed and developed on an Android phone whose make or type was Samsung Galaxy J5 (2016). The TAMAS is an automated mobile system which facilitates the tourist's or visitor's interaction with Zambia's Tourism Industry in navigating the tourism attraction that include national game parks, waterfalls, rivers, lakes, dams, historical landmarks, museum, traditional ceremonies, towns, but to name a few. The system is also used to online book the hotel of preference whilst away, hire the transport of choice, and engage the tour guides your choice. The TAMAS would also allow the tourists to book the flights from their country of origin to Zambia.

### A. Prblem Statement

First, The Zambia's economy relies on the three major economic sectors these include mining, agriculture and tourism. The tourism industry includes the game reserved areas with designated national parks, falls, man-made lake, rivers, and Maramba culture village. Of these, the game reserve is the major tourism industry, with approximately twenty (20) game parks spreading across the country. According to the Zambia's Tourism Report in [1] stated that about thirty percent (30%) of Zambia's seven hundred and fifty two thousand and six hundred and fourteen square kilometres (752,614 km$^2$) is reserved for wildlife. The Report further highlighted that there were twenty (20) national parks and thirty four (34) game management areas in the country. Each game park harbours specific wild animals, for instance the Mosi oa Tunya and Sioma Ngwezi National Parks have a lot of Elephants, the Kafue National Park has majority of the Zebra, Antelopes, Lechwes and Elephants. The South Luangwa, and North Luangwa have many of the buffaloes, Warthogs and Giraffes. Other wildlife in these Luangwa Parks includes the carnivorous such as Lions, Tigers, and Leopards but to list a few.

It is worthy mention that the Zambia's tourism has largely been serviced by the hospitality and transport industry. ZDA Report in [2] pointed out that the Zambia's tourism industry was comprised of several types of enterprise these included hotels, lodges, guesthouses, tour operators, activity and transport providers. Though he bemoaned that such a sector was dominated by small and medium sized operators that were not vertically integrated. He further lamented that the sector was largely reliant upon overseas providers for services such as representation, marketing and flights. It is against such a background that the Tourists Accessibility Mobile Assistive System (TAMS) was envisaged to develop a local one-stop integrated system which would provide information for game parks, hotels, lodges, transport (road, water, and flights), tour guides, and marketing. Therefore, it is imperative that when the tourists leave their countries, they need information that would help them plan about their travel on which game parks they will tour and the hotels to lodge in. They need to know which animals they are interested to see, and the standards of the hotels of their choices. Since there are so many game parks and numerous hotels, it is always a challenge for the tourist to plan their trips. The other thing the tourists need to arrange in advance is to engage the tour guides. All this information should be integrated and provided at one-stop shop.

As discussed above, marketing stands to be one of the factors that has not been utilised as a tool to attract foreign tourists. The provision and effectiveness of marketing would create linkages with other sectors of economy. The Zambia CSD Report in [3] pointed out that Tourism creates opportunities for both large and small entrepreneurs; promotes awareness and understanding among different cultures; breeds a unique informal sector; and creates economic linkages with agriculture, light manufacturing and construction industries, handicrafts, art and souvenirs. The Report further highlighted tourism it created linkageswith service sectors such as health, education, entertainment, banking and insurance and also helped conserve the environment. In view of that, the TAMAS has a component that deals with marketing of the Zambia's tourism. In that way, the TAMAS shall facilitate the linkages of the tourism with other industries mentioned above.

### B. Obectives of the TAMAS

The TAMAS was developed in order to accomplish the following objectives:

- Design and develop a friendly user and highly interactive tourism mobile assistive system,
- Download the Android Studio version 2.1.2 to be used to build the TAMAS,
- Write the TAMAS source code using the JAVA language,
- Use XML for the images,
- Download and install the universal serial bus drivers to be used to transfer the application from the computer (android studio) to an android phone.
- Make TAMAS visible world-wide,
- Provide a manual or user guide to aid tourist operate the TAMAS,
- Develop an online hotel, tour guide and transport booking sub component systems of TAMAS,
- Link the tourism to other industry such as education, health, sport, mining, and others,
- Provide adequate information on the geographical positions of all the Zambia's national game parks,
- Display all the Zambia's tourist attraction,
- Show costs for transport to-from tourist sites,
- Provide site pictures for all the tourist attraction in Zambia,
- Provide on the system all tourist services such as hotels, restaurants, bars and transport,
- Navigate the TAMAS to access all the tourism attraction of Zambia,
- Market the existing Zambia's tourism attraction to the world community.

### C. Organisation of the paper

The Chapter is organized in the following parts: the first Section introduces the TAMAS, by highlights on the development of the system. The Section also outlines the statement of problems that led to envisaging the development of the model. The second Section discusses similar systems done elsewhere. The section is presented in two categories, the one that highlights the Zambia's experiences in tourism. The other category is the mobile assistive, which sited some actual examples done elsewhere. The TAMAS is presented in the third Section by articulating the role each component plays during execution. The fourth Section explains the challenges experienced during the development and implementation stages. The fifth Section discusses the analysis of the implementation of the TAMAS and how significance some components are to the overall function of the system. The sixth Section summarises the general function of the TAMAS and the benefits it offered to the community and the tourism industry.

## II. LITERATURE REVIEW

Other authors have discussed the potential and importance of Zambia's tourism industry. They have also expressed how such an industry has contributed towards economic growth. However in this Section, literature review is done in two categories these are first is the Zambian experiences, and second the mobile assistive system.

### A. The Zambia's Experiences in Tourism

They have touched on the supporting industry that has made tourism benefit and these are hospitality and transport. In [4] he pointed out that tourism was an important sector for the Zambian economy, where she indicated that from 1997 to 2008, the international tourists averaged 5.4% of total exports. She continued to cite that the number of international tourists in Zambia increased quite impressively by about 400%, from 163,000 arrivals in 1995 to 815,000 in 2010. She stressed that the revenue from international tourists grew consequently, from $29 million (USD) in 1997 to $212 million in 2009. She emphasized that such statistical data signifies that tourism represented a very positive economic stimulus for the rest of the economy, through its direct linkages with transport and hospitality industries. She stressed that there were a lot of investment opportunities through hotels, lodges and safari operations. Like other authors, Morgan mentioned that Zambia had roughly twenty (20) national parks and thirty four (34) game areas, as well as twenty three million (23,000,000) hectares devoted to the conservation of exceptional variety of animals .

In [2] it was pointed out that Zambia stands out as one of the prime tourism destinations in Africa offering a wealth of natural tourism assets – waterfalls, lakes and rivers holding about 35% of Southern Africa's total natural water resource, 'wildlife protected areas' occupying about 10% of the country's total land area, and a tropical climate – a passport to sunshine almost throughout the year. The Report proudly cited out that Zambia was home of the Victoria Falls, which is one of the Seven Natural Wonders of the World and UNESCO Heritage site. Like other authors, the Report highlighted that there were twenty (20) National Parks and thirty four (34) Game Management Areas (GMAs), totaling twenty three million hectares (23,000,000) of land devoted to spectacular wildlife. The further indicated that there was vast diversity in animal species, that included antelope (roan, sable, lechwe, sitangunga, defassa waterbuck and hartebeest); predators

(cheetahs, lions, leopards and spotted hyena); and large populations of elephant, buffalo, zebra, crocodile and hippo. The other attractive things the Report cited were a rich array of traditional cultural festivities and events, that included: Kuomboka, Nc'wala, Umutomboko, and Likumbi Lya Mize.

In [5] it was stated that Zambia was fortunate to have some highly desirable natural tourism attractions based on wildlife, waterfalls, scenery, and wilderness experiences. The Author added that other assets of existing or potential appeal were cultural traditions, historical heritage and recreational water bodies. He also identified other natural and man-made attractions that included adventure activities such as white-water rafting, scenic flights; the historical sites like cave paintings, David Livingstone sites, Shiwa N'gandu house; the cultural tourism, for example the museums, traditional ceremonies, dances, village tours and stays; the scenic enjoyment , for instance the waterfalls, Mutinondo wilderness, Batoka Gorges; and the entertainment like the casinos, bars, restaurants, night clubs. In view of that the Author emphasised that the Government Republic of Zambia (GRZ) perceived tourism as a sector that offered economic diversification beyond agriculture and mining. Though at the same time, the Report bemoaned that marketing of cultural heritage and community attractions had been very limited.

### B. Mobile Assistive Systems

Other scholars have discussed some of the mobile assistive systems in order to address the challenges faced in the tourism industry. In [6] they Franz Pühretmair, and Dimitrios Buhalis (2008) pointed out that tourism and travel experiences were still highly restricted by physical accessibility barriers, such as: transportation constraints, inaccessible accommodation and tourism sites as well as information barriers such as a general lack of information, inadequate or incomplete information or poorly designed web sites.

In [7] increasingly powerful assistive technology capabilities are being developed specifically for mobile and portable devices, such as the Kurzweil-National Federation of the Blind Mobile reader (www.knfbreader.com), which is a commercial OCR (optical character recognition) system running on a standard camera cell phone, and an MMS (multimedia messaging service)-based sign language system for cell phones. In [8] and [9] they proposed strategies for annotating and sharing geographical data, augmenting existing databases with information about accessibility (such as obstacles, hazards, lowered curbs, accessible traffic signals). Annotation of as well as access to geographical data is facilitated by the availability of portable navigation systems, possibly integrated in a cell phone. In [10] they Moreno et al. (2008) presented a proposal of accessibility requirements to consider in the design and development of an electronic guide in the application domain of museums.

In [11] they pointed out that around 50% of population in the developed countries was using Internet with opportunities to choose holidays on the basis of available information at the Internet. They also mentioned that several tourists were already making their own travelling and holidays' decisions on the basis of the information provided at the Internet. They cited that around 90% of the United States of America households were using the video-on-demand technology with opportunities to choose a travelling itinerary. In support of this, in [12] he emphasised that the on-line tourism and travellers markets, and the destination management system were using intranet-extranet-Internet supported tools, a computer reservation system and a global distribution system for tourism management and marketing as factors for building and maintaining competitive advantage. He gave several examples of the development of the tourist economy in connection with the international ICT in different areas of tourism industries focusing on airlines and travel, hospitality, tour operators, travel agencies, computer reservation and management systems. He cited the types of websites used for planning and booking leisure trips in the USA as follows: search engine sites, portal sites, travel guide sites, newspaper or magazine sites, but name a few.

The AM-report in [13] stated that tourism activity was increasingly being shaped by price comparison and combination technology; new applications for mobiles that offer a wide range of opportunities were being developed; social networks were consolidating themselves within a more transparent market in which citizens were able to provide services together; changes in the concept of the value chain were producing new business models. The Report further emphasised that with access to the vast pool of information available online, an increasing number of travellers were seeking information via the internet prior to making any travel decisions. Hence, it imperative that the TAMES gives valuable information to tourist well ahead before their travel.

## III. THE TAMAS DEVELOPMENT

The TAMAS system was developed using Android Studio version 2.1.2 which was downloaded from [14] and was distributed for free under the Google Inc. license. Currently the Android Studio cannot be installed on the mobile phone. In view of this, the Android Studio was installed on an HP laptop with specification of Intel(R) Celeron (R) CPU N2820 @ 2.13GHz. The installing of the Android Studio into a laptop served a greater opportunity of an adequate work space on a wider keyboard than when it is done on a mobile phone. Other software requirements used were Android SDK tools such as Google Maps Android API v2 and Fused Location API, Android Studio the IDE, Java Development Kit (JDK) version 7.0 or higher, JRE (Java Runtime Environment) version 8.0 or higher, and Operating system – Windows 7 or better. Having organised all the software and hardware requirements, the code was written using the JAVA language. During the development of the code, all relevant system testing were done.

After writing and testing, the accomplished application had to be transferred into an Android mobile phone. However, before transferring the system, first the universal serial bus drivers were downloaded in order to install the application from the computer (android studio) to an android phone. It

was important that these drivers were used for the application to run on a physical phone. The two devices: laptop and mobile phone were connected with a USB cable and the download was implemented. During the transfer of the system, the two interface screens were displayed in a cascading form as shown in Figure 1. On the background is the laptop screen entitled 'The Tourist – [C:\Users\Jameson\AndroidstudioProjects\The Tourists] – [app] - …\app\scr\main\res\drawable\f.jpg'. Overlapping on the laptop screen was the one for the mobile phone with a title 'Select Development Target' as demonstrated in Figure 1.
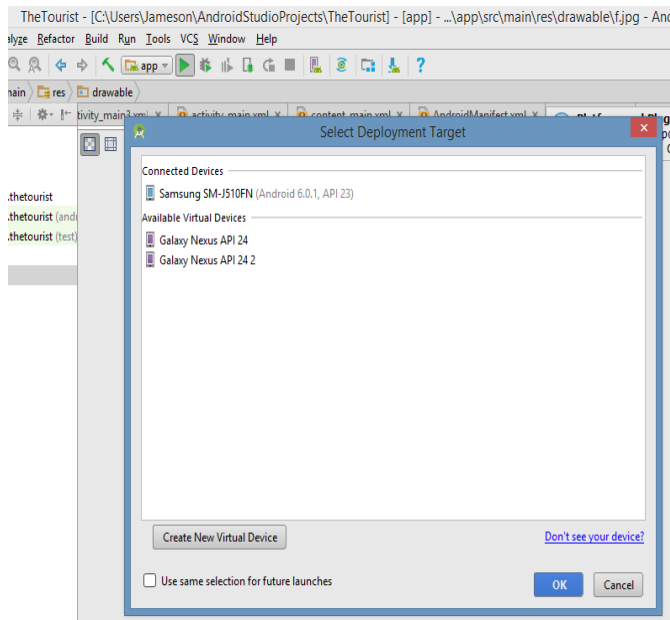


Figure 1. The Two Interfaces of Laptop and Mobile Phone

From the mobile screen two parts were shown and these were, the first one was the Connected Devices, which was transferred to the mobile phone. The second part was the Available Virtual Devices, which emulated the mobile phone on the laptop. The application was downloaded from the above mentioned laptop into a Samsung Galaxy J5 (2016) and an icon in this work named TAMAS was displayed on the screen of the phone as shown in Figure 2.
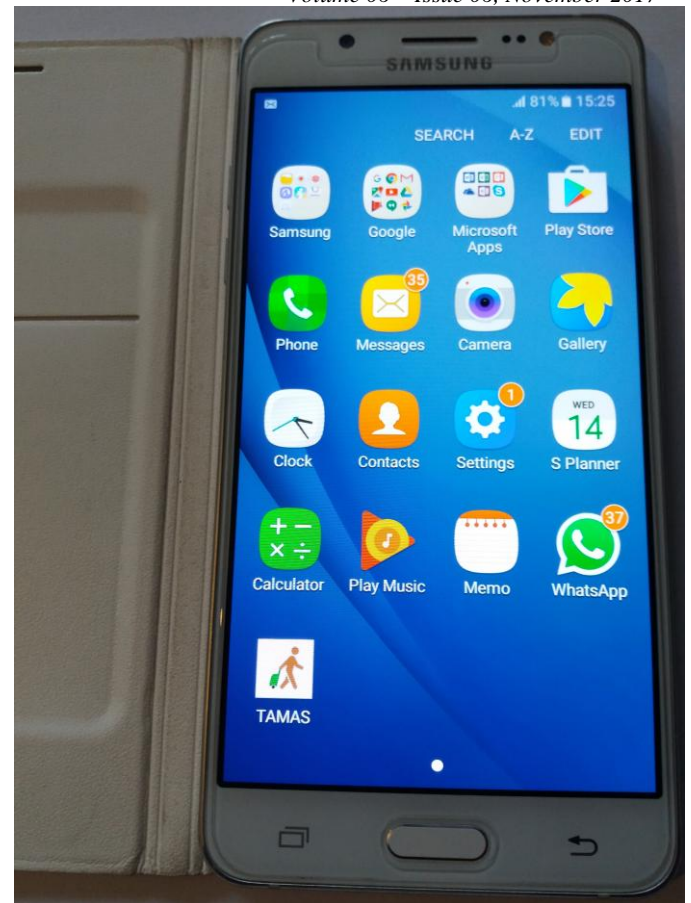


Figure 2. The TAMAS Icon on a Mobile Phone Screen

Once a tourist taps or clicks on the 'TAMAS' icon, the system prompts for the creation of an 'Account'. The system further prompts to enter the Username and Password. The system further prompts the user to re-enter the Password to ascertain the authenticity. When the Accounts creation is successful, it immediately displays the 'Welcome to TAMAS' Screen as displayed in Figure 3. The 'Welcome to TAMAS' screen has four Menu items these include: 'Attraction', 'Experiences', 'About Zambia', and 'Services'.

From Figure 3, when the tourist selects the Menu item 'Attraction', the Zambia's Tourist Attraction screen appears as illustrated in Figure 4.
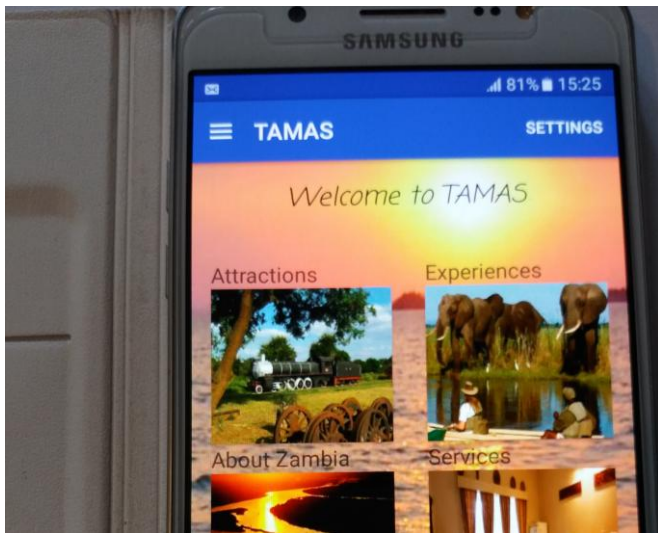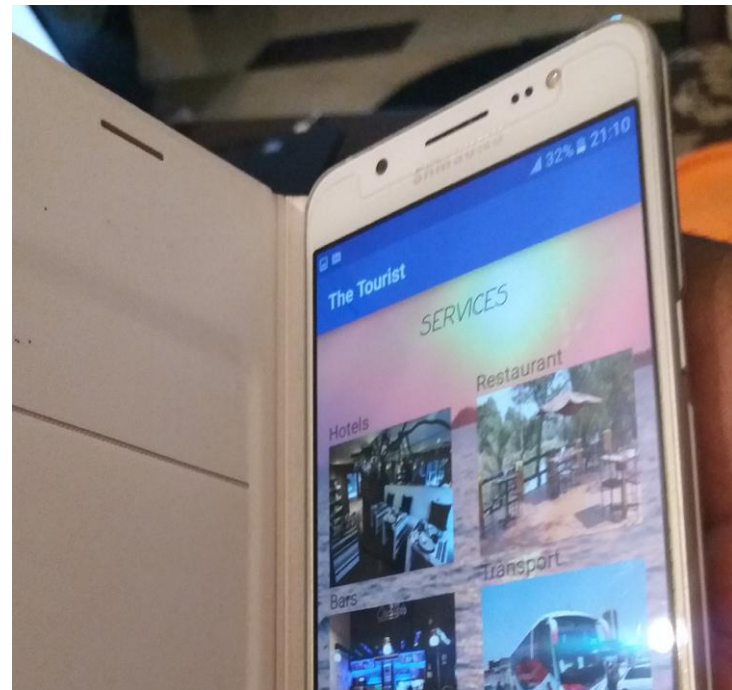
Figure 3. Welcome to TAMAS Screen



Figure 4. Zambia's Attractions Screen

As indicated the screen displayed the tourist attractions that ranged from dams, landmarks, national parks, rivers, lakes, waterfalls, traditional ceremonies to towns. If the user clicks on the national parks, all the parks that exist in Zambia are displayed such as: Kafue, Lonchinvar, Lower Zambezi, Mosi-O-Tunya, North Luangwa, Nsumbu, South Luangwa, Blue Lagoon, Luambe, Mweru Wantipa, Nyika, Kansaka, Liuwa Planes, Sioma National Parks but to name a few.

From the same Figure 3, if a tourist chooses 'Services', the service screen shown in Figure 5 appears with the following Menu items: 'Hotels', 'Restaurant', 'Bars' and 'Transport'.



Figure 5. The Service Screen

If the user chooses the Menu item 'Transport', the screen displays all kinds of vehicles that serve the 'Hotel' from different sources or destinations. The system also displays the prices for booking such transport from one point to the other end. The prices of these transport to the nearest airport is also indicated. Some major transporters have online booking systems that are linked to the TAMAS. In this way, it allows the users to make the bookings wherever there are in the parts of the world.

## IV. CHALLENGES TO IMPLEMENT TAMAS

One of the major challenges is the network coverage which is very poor especially in those large game parks that stretches very far from the mobile towers installations. In such remote areas of the park, signals are very weak such that loading some system pages could not be completed. In many cases the system is hanging making the tourists constantly rebooting it. Therefore, troubleshooting of the system become a problem as it required technical know-how of the technology involved.

The other problem is that larger parts of the game parks are not serviced by electricity, and many mobile phones have their batteries flat. Only a few lodges have some solar panels and could allow the tourists manage charge their mobile phone batteries. In that way the tourists can have access to the system.

Other challenges included the un-availability of units, such as the "airtime" to recharge for connectivity to the network. In these game parks, there are no Internet Service Providers (ISPs) centres that sell the units or "airtime". In many cases, loading the units / airtime is sometimes challenged by weaker

signals that could not allow connectivity and as such loading frequently failed.

The other challenge is when the developers want to make some maintainers on the system they cannot do it directly on the mobile phone, but has to be on the laptop. All the code modification has to be worked on the laptop, compiled and tested. Once the testing is successful, the system is transferred to the mobile phone has already explained above. Such an operation requires experienced mobile programmers.

## V.    DISCUSSIONS

The TAMAS enables the visitors and Zambia's tourism industry to effectively interact on the accessing of information. The visitors are able to access useful tourism industry's information at any-time, and anywhere as they wished from their respective countries before they started their journeys. The TAMAS gives visitors access to tourism information beforehand and  served as a cost serving measures especially at planning and preparatory of the trip by the travelers. It becomes cheaper, for the traveler to know exactly all the travelling logistics involved. In that way the tourists carefully plans his/her budget well in advance. This avoids a random travelling to various game parks as this may cause overheads costs towards the tourist's budget.  The TAMAS gives the visitors all tourism industry information at one stop.

The effective implementation of the TAMAS is assured in the sense that World-wide majority of people own mobile phones. The only requirement is that the phone should have an Android. The more people access the TAMAS, the more effective marketing of the Zambia's tourism industry is achieved. In fact the mobile phone is a gadget which people find more convenient to carry as it is potable. In that way, many tourists would carry the system along with as they embark on their journey. In addition the prices of mobile phones has gone down already this implies many could afford the Android the possibility of many acquiring the TAMAS ofcource those with interest to travel to the Zambia's tourist attraction areas.

The TAMAS as discussed earlier on, it will help the tourist plan properly as they have all the first-hand information before travelling. In that way they are able to budget for their trip properly. As illustrated earlier, the visitors would even pay before starting off as the system has such facilities. Hence, this lessens the burden of travelers carrying money or losing it on the way. They can pay for hotel lodging, transport, and tour guides.

The TAMAS facilitates effective communication by reaching out the planned places to ensure that all is set. For instance, before starting the tourist would have information on which hotels are full, which tour guides are free. In this way the visitor can find other alternative hotels, lodges and transport to book.

The adequate reaching out to majority of the clients makes it possible to compete with other countries that have similar tourism industry. As the tourism attraction is visible to public,

a lot of people would be motivated to travel and experience what they saw in the system.

Such an interactive system make the client do a lot of operations on their own such as hotel, transport and tour guide booking. In that way, it makes the tourism management employ a few staff and this cost serving on the part of the industry. The industry can realize a lot of profit which it can use to improve the infrastructure of the organization. The industry can also contribute to the growth of the GDP of the country.

As the system is accurately captures all the monies the clients paid electronically, it is easy to account for all the transaction captured. In that way, the accountability of the management of the business of the day would be successfully done. At the end of a tour, each tourist fills an evaluation electronic form to give an account on the services rendered. This helps the Management assesses to whether their services are to the satisfaction of their clients. Such an assessment can help the authority to quickly adjust where there are not doing fine.

## VI.    CONCLUSIN AND FUTURE WORK

The TAMAS envision was capitalised on the overwhelming of people's affordability to own mobile phones and the upcoming of mobile programming technology. The two motivated the commencement of the project. For instance, there was an assurance that more than ninety-five (95%) percent of the tourists visited Zambia owned mobile phones. This gave the planners together with the system developers confidence of having enough clients. In addition, the utilisation of the mobile programming technology also encouraged the technical staff to design and develop the desired code.

TAMAS was envisaged to give the travelers all relevant tourism industry information that pertains to game park wildlife availability, lodges / hotel facilities, booking of tour guides and transport services. All these can be done at the traveler's country of origin before embarking on the trip. Actually, TAMAS empowers the users to acquire all relevant information surrounding the tourism industry. Before the visitor starts has an opportunity to choose the national game parks that inhabits the animals he/she prefers to view. In that way the visitor can even go ahead and book the right transport which goes to that particular park of his/her choice. At this juncture, the user does not even need to wait for the engagement of tourist.

In fact the ability of TAMAS to provide the relevant tourism information to the public served as a very effective marketing strategy. In that way the local and international community acquired knowledge of the abundance of the tourist attraction Zambia had. In addition, the tourists had also adequate information on the favorable services that were rendered in these national parks. As already discussed, some of these services included the luxury hotels, restaurants, bars, tour guides, transport, but to name a few.

The other motivation factor was the affordability of resources that included: the Android phone, and the laptop. Other

resources included the software such as Android SDK tools such as Google Maps Android API v2 and Fused Location API, Android Studio the IDE, Java Development Kit (JDK) version 7.0 or higher, JRE (Java Runtime Environment) version 8.0 or higher, and Operating system. All these resources were gathered, assembled and installed accordingly and the development of the system was done. Having accomplished the building the code in a laptop, the system was tested and passed all the stages. Thereafter, the whole system was downloaded from the laptop into a mobile phone that had Android.

As it has been discussed that the development or writing of the code was done on a laptop, and thereafter the system was transferred into the mobile phone. To accomplish such processes, first some software needed to be downloaded and installed into a laptop. During such installation, a number of troubleshooting that took long time was done. At tis juncture, also some configurations of some files were done as well. Other challenges were incompatibility of some system files during this installation. Therefore the whole process was cumbersome and time wasting. In view of this, there will be some endeavours that in near future, the development of the code will be done directly on the mobile phone. However, it is important to recognise that some of those downloaded software could not be uploaded into the mobile phone, hence, first the use of the laptop. The other challenge of not first using the mobile phone was that its interfaces or features are too small such as the screen, keyboard and battery. However, to overcome such constraints faced by the mobile phone is still a nightmare. It requires some intensive and extensive research to be carried out and provide tangible solution to the problems.

## REFERENCES

[1] Zambia's Tourism Report, 2016. http://www.zambiatourism.com/destinations/national-parks

[2] Zambia Development Agency (ZDA). Tourism Sector. October, 2014

[3] Zambia CSD Report, 2016. www.un.org/esa/dsd/dsd_aofw.../ZambiaCSD16-17_full_report.pdf

[4] V. Morgan, "Meetintng the Challenges of Climate Change to Tourism in Africa: the Case Staudy of Zambia." Cambridge Scholars Publishing. ISBN, 1443865095, 9781443865098, 2016.

[5] L. Dixey, "Production, Finance and Technology (PROFIT) : Inventory and Analysis of Community Based Tourism in Zambia." A USAID Private Sector Development Programme. Lusaka, Zambia, 2005

[6] F. Pühretmair, and D. Buhalis, "Accessible Tourism Introduction to the Special Thematic Session," 2008.

[7] R. Manduch, and J. Coughlan, J. (2014). "Portable and mobile systems in assistive technology introduction to the special thematic session, 2014. https://pdfs.semanticscholar.org/0008/ac18be45706749a4aa1ef97a1f4bc407a6a9.pdf

[8] T. Voelkel, R. Kuehn, and G. Weber, "Mobility Impaired Pedestrians are not Cars: Requirements for the Annotation of Geographical Data," 2008.

[9] H. Holone, G. Misund, H. Tolsby, and S. Kristoffersen, "People Helping Computers Helping People: Navigation For People With Mobility Problems By Sharing Accessibility Annotations," 2008.

[10] L. Moreno, M. C. Galvez, B. Ruiz, and P. Martinez, "Inclusion of accessibility requirements in the design of electronic guides for museums," 2008.

[11] B. Štefan, and K. Zvonko, "Information and Communication Technology in Tourism. University of Primorska Slovenia," 2004.

[12] D. Buhalis, "eTourism: Information technologies for strategic tourism management. Essex: Pearson Education," 2003.

[13] AM-reports, Technology in Tourism. World Tourism Organization (UNWTO) Affiliate Members. vol. 1, 201. 2011.

[14] http://developer.android.com/studio/index.html